



*Demand Side Management  
and Demand Response*

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*Energy & Telecommunications Interim Committee*

*5/2/2008*

*Bill Thomas*

*Manager Regulatory Support Services*



# Regulatory Support Services



- **Deb Young – Consultant**
  - 22 years utility experience
  - 19 yrs DSM experience



- **Connie Moran – Administrative Specialist**
  - 26 years utility experience
  - 15 yrs DSM experience



- **John Campbell – Engineer**
  - 7 years utility experience
  - 20 years DSM experience



- **Dave Bausch – Engineer**
  - 22 years utility experience
  - 14 years DSM experience



- **Bill Thomas – Manager**
  - 24 years utility experience
  - 13 years DSM experience

# ***DSM Program Implementation Contractors***



**18 FTE**



**6 FTE**



**0.5 FTE**

**Montana Department of Health and Human Services**

**7 Human Resource Development Councils (multiple subcontractors)**

# ***DSM Strategy***

- **Acquire cost-effective DSM resources at or below avoided cost**
  - Energy can be saved for less than it can be purchased
  - Levelized cost of DSM is approximately \$20-25/MWH
- **Annual Electric DSM Goal = 5.0 aMW**
- **Resource intensive.**
  - DSM acquired in small increments from high volumes of customers
  - Example: approaching 500,000 CFL mark since January 2005
- **Multiple mechanisms used:**
  - On site inspections (audits)
  - Rebates/incentives
  - Marketing & promotion
  - Trade Shows, Community Events, Association meetings
  - Direct contact
  - Certifications & preferred installation contractors
- **Support development of trade ally infrastructure**
- **Mix of DSM and USB funded activities for all customer sectors.**

# ***DSM Strategy***

- **Broad mix of programs and technologies**
  - **From Single Compact Fluorescent Light bulb (CFL) with E+ Mail-in Energy Usage Survey ... to comprehensive design and measures at Bozeman Public Library with E+ Business Partners.**
  - **From USB-funded Commercial Lighting Rebates for Choice Customer ... to DSM-funded air-handling system renovation at the Mitchell Building in Helena.**
- **Primary sales tool is persuasion**
- **Primary measurement tool is estimation**

# ***DSM Programs***

- **Electric DSM Programs**

- Available to residential, commercial, industrial, irrigation customers
- Broad program applicability, coverage and eligibility
- 2008 budget = \$5-6 Million (or higher depending on consumer interest)

- **Natural Gas DSM Programs**

- Available to residential customers
- 2008 budget = \$1 Million
- Future expansion to commercial natural gas customers is expected in 2009

# ***DSM Programs***

## **USB Programs**

- **E+ Energy Audit for Home**
- **E+ Energy Appraisal for Business**
- **E+ Irrigator Program**
- **E+ Free Weatherization**
- **E+ Renewable Energy**

## **Default Supply DSM Programs**

- **E+ Home Lighting**
- **E+ Commercial Lighting**
- **E+ Residential New Construction**
- **E+ Electric Motors**
- **E+ Business Partners**
- **Northwest Energy Efficiency Alliance**
  - **Market transformation**
  - **Integrated design lab**
  - **Building operator training and certification**
  - **Sector initiatives**
  - **Regional marketing**
  - **Consultations & analysis**
- **Natural Gas Residential Savings**

## ***Missoula Green Blocks project***

- **Cooperative project with City of Missoula**
  - **Mayor's Advisory Council on Climate and Sustainability**
  - **Mountain Water Company**
  - **Allied Waste**
- **Four 2-square block areas selected for weatherization**
- **Range of housing vintages**
- **Services provided at no direct charge to participants**
- **Home Energy Audit**
- **Full weatherization (insulation, infiltration reduction, programmable thermostats, tank/pipe insulation, CFLs, water conservation measures, waste management assistance)**
- **Follow-up evaluation**

# *Future Developments*

**Advanced Metering Infrastructure (“Smart Metering”)**

**Demand Response Programs**

**Smart Grid**

# ***Demand Response***

## **What is it?**

**Demand Side strategy to implement programs that seek to lower peak demand during specific, limited periods by temporarily curtailing electric usage or shifting usage to other periods.**

**These programs typically use communication and control technologies to temporarily reduce demand in specific energy-using devices or systems.**

## **Types of Demand Response Programs**

- **Time of Use Pricing**
- **Real-time pricing**
- **Critical peak pricing**
- **Direct Load Control**
- **Curtailment / interruptible load**

# ***Demand Response***

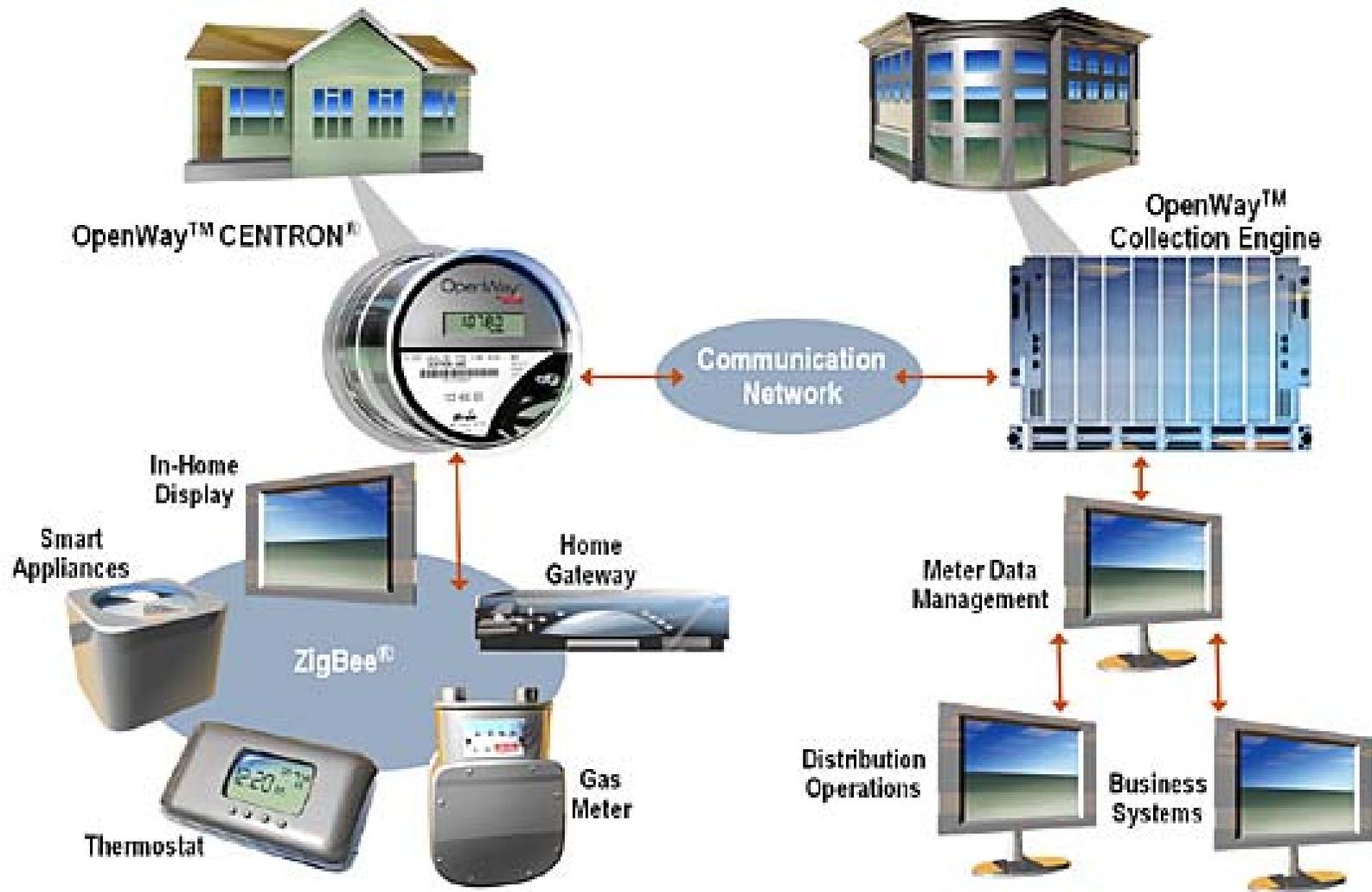
## Forces and trends

- **2005 Energy Policy Act**
  - Amends PURPA standard
  - Requires Smart Metering and time-based pricing be offered
  - States have option to adopt/reject the amended standard
- Rising power costs, West cost power crisis and Northeast rolling blackouts created impetus
- Growing interest nationally in Advanced Metering Infrastructure (AMI) and the added services it enables
  - Some large utility systems are either implementing or experimenting
- Regulators' interest in keeping up with national trends
  - Wants TOU Rates investigated
  - Wants AMI and associated capabilities tested
  - Wants to insure we are "...getting the most from the existing system..."
- Economics are highly variable
  - Sensitive to customer/load density and operations savings

## Investigations to date:

- Direct Load Control - analysis & modeling
- Residential Time-of-Use Pilot Project – analysis & modeling
  - Pilot project will not yield sufficient information for decision-making
  - Full NWE system study is indicated ... Included in 2008 Electric Resource Plan

# Advanced Metering Infrastructure (“Smart Metering”)

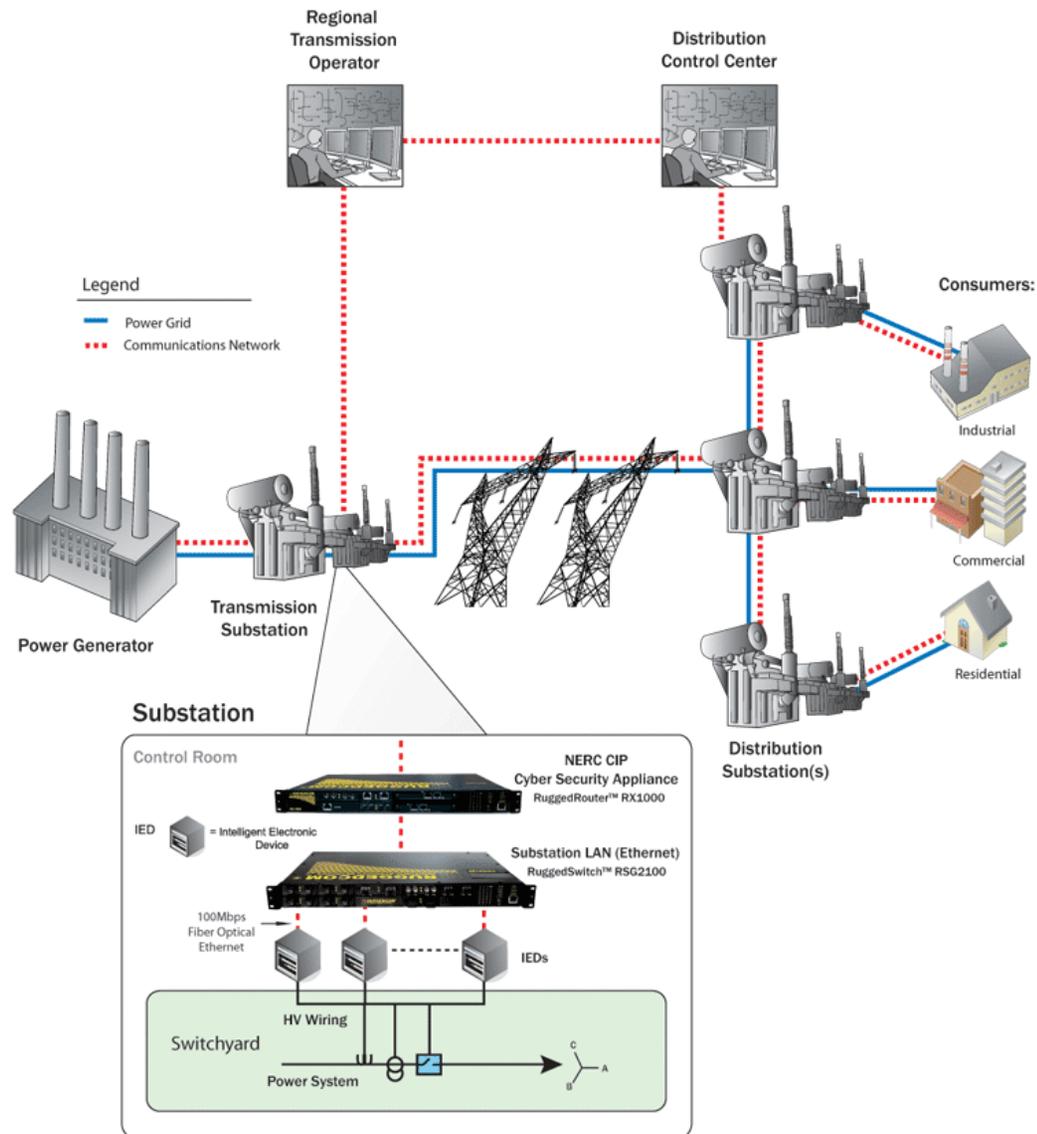


# ***Smart Metering***

## **Smart Metering Capabilities (enabled by interval meter reading):**

- **Price-Based Options**
  - **Time-of-use (TOU)**
  - **Real-time pricing (RTP)**
  - **Critical Peak Pricing (CPP)**
  
- **Incentive-Based Programs**
  - **Direct load control**
  - **Interruptible/Curtailable Service**
  - **Demand Bidding/Buyback Programs**
  - **Emergency DR Programs**
  - **Capacity Market Programs**

# Smart Grid



# Smart Grid

## Smart Grid - Potential Capabilities & Benefits:

- 1. Detect and address emerging problems before they impact service.**
- 2. Make protective relaying be the last line of defense, not the only defense.**
- 3. Respond to local and system-wide inputs and monitor and report on broader system problems.**
- 4. Incorporate extensive measurements, rapid communications, centralized advanced diagnostics, and feedback control that quickly return the system to a stable state after interruptions or disturbances.**
- 5. Automatically adapt protective systems to accommodate changing system conditions.**
- 6. Re-route power flows, change load patterns, improve voltage profiles, and take other corrective steps within seconds of detecting a problem.**
- 7. Enable loads and distributed resources to participate in operations.**
- 8. Be inherently designed and operated with reliability and security as key factors**
- 9. Provide system operators with advanced visualization tools to enable them to provide the essential human oversight.**

# ***Smart Grid***

## **Smart Grid - Potential Capabilities & Benefits:**

- **Remote connect/disconnect**
- **Reduced losses**
- **Better/faster outage detection and service restoration**
- **Cost savings due to automated operation, predictive maintenance, self-healing, and reduced outages**
- **Increased asset utilization.**

# Costs

- **Communications system – Radio, PLC, telephone**
- **Meters with interval read capability**
- **I/T requirements – data management**
- **Billing system enhancements**
- **Customer premises equipment**
  - **Thermostats**
  - **Displays**
  - **Circuit breakers with radio interface (ZigBee, WiFi, etc.)**
  - **Disconnect devices**
- **Sensors & switches**
- **Operations & Maintenance**

# ***Issues & Concerns***

- **Service territory geography**
  - **Customer density**
  - **Load density**
  - **Line miles – transmission & distribution**
- **Energy supply economics**
  - **On-peak versus off-peak prices**
- **Amount of “shiftable” load ... (the “Demand Response” effect)**
  - **Air conditioning saturation**
  - **Amount of curtailable load**
  - **Willingness & ability of participants to change lifestyle**
- **Voluntary versus mandatory programs**
- **Operational savings achievable**
- **Previous AMR deployment**
- **Interoperability & “future proofing”**

# ***Smart Metering/Smart Grid***

## **Request for Proposal – Scope of Work**

- Task 1: Project Plan**
- Task 2: Project Management**
- Task 3: Energy End Use Study – Electric and Natural Gas**
- Task 4: AMI Technology Evaluation and Selection**
- Task 5: Evaluation of Potential DR Activities/Programs**
- Task 6: AMI/DR Economic Analysis (Costs & Benefits)**
- Task 7: Undesirable Effects of AMI**
- Task 8: Special Analysis Scenario for Large Customers**
- Task 9: Smart Grid - Transmission and Distribution**
- Task 10: Project Final Report**

# Questions & Comments

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